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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/800,168

03/12/2004

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TOW-068

9057

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EXAMINER

WANG, EUGENIA

ART UNIT

PAPER NUMBER

1745

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

04/27/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No. 10/800,168	Applicant(s) ENJOJI ET AL.	
	Examiner Eugenia Wang	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-6, 8-10, 12-14, 16 is/are rejected.
- 7) ☒ Claim(s) 3, 7, 11, 15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                       | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____                                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2/6/07</u> .  | 6) <input type="checkbox"/> Other: ____                           |

## **DETAILED ACTION**

### ***Response to Amendment***

1. In response to the amendment received March 13, 2007.
  - a. Claims 1-8 are still pending and claims 9-16 have been added as per Applicant's request;
  - b. The drawing objection has been withdrawn in light of the amendment to the specification;
  - c. The previous prior art rejection of record with respect to US 2002/0164509 (Wheat et al.) in view of US 2002/0006537 (Kobayashi et al.) have been withdrawn. A new grounds of rejection has been made herein, necessitated by the amendment.

### ***Information Disclosure Statement***

2. The information disclosure statement filed February 6, 2007 has been placed in the application file and the information referred to therein has been considered as to the merits.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
4. Claims 1-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to

which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 1, 5, 9, and 13 recite that the fuel cell system is "free of a humidifier for humidifying said hydrogen containing gas supplied to the anode of said fuel cell" (lines 10-11, 12-13, 9-10, and 12-13, respectively). However the claims also recite maintaining the humidity of the hydrogen containing gas (lines 9-10, 10-11, 7-8, 10-11, respectively). By maintaining the humidity of the hydrogen containing gas, a humidifier to the hydrogen-containing gas must exist. Since claims 2-4, 6-8, 10-12, and 14-16 are dependent one of the independent claims above and fail to rectify this issue, they are rejected as well.

Examiner suggest changing the language regarding the humidifier to that expressed in the specification, such that no humidifier for humidifying the hydrogen-containing gas is provided 'on' the anode side (SPEC, p3, lines 25-27), rather than "to" the anode side (as expressed in the claims of the instant application).

For the prosecution of this office action, Examiner has applied the claim interpretation that the humidifier is not provided on the anode side but that the cathode side humidifier is used to provide humidity to the hydrogen-containing gas fed to the anode.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 5, 9, and 13 recite that the fuel cell system is "free of a humidifier for humidifying said hydrogen containing gas supplied to the anode of said fuel cell" (lines 10-11, 12-13, 9-10, and 12-13, respectively). However the claims also recite maintaining the humidity of the hydrogen containing gas (lines 9-10, 10-11, 7-8, 10-11, respectively). It is indefinite and unclear how the hydrogen-containing gas has its humidity maintained if no humidifier for humidifying the hydrogen-containing gas is supplied to the anode side of the fuel cell. Since claims 2-4, 6-8, 10-12, and 14-16 are dependent one of the independent claims above and fail to rectify this issue, they are rejected as well.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 5, 9, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by US 2001/0010875 (Katagiri et al.).

As to claims 1 and 5, Katagiri et al. teaches a humidification system for a fuel cell. The reactive gases are supplied to the fuel cell (air, which supplies oxygen or hydrogen) (para 0038, lines 6-8). In this invention, humidifier [6] is used to humidify the air (para 0039). A supercharger [17] is driven by a motor and used to for delivering air (oxygen-containing reactive gas) to the system, thus acting as a flow-rate controller. The humidity that is imparted on the air is then brought to the fuel cell. The fuel cell [1]

Art Unit: 1745

comprises of solid polymer membranes that separate oxygen and hydrogen (para 0037). Although the transfer of humidity from the air to the hydrogen via water transport from the cathode to anode is not explicitly stated, since the water permeates the separator membrane and fuel cell electrodes (anodes and cathodes) are generally porous, it is inherent that the water would diffuse into the anode as well, thus humidifying the hydrogen. It is also inherent that the humidity of the hydrogen would remain at a predetermined range less than 100% (diffusion models can be used). Additionally, a gas bypass passage [21] allows the gas to bypass the humidifier [6]. The flow regulating valve [22] is controlled using outputs from a controller [23], which is hooked up to a device for measuring the dewpoint of the gas [19] (as applied to claim 5) (para 0045). An algorithm for the dew point control of the humidified reaction gas can be seen in figure 3. This bypass system based on dewpoint control, thus allows for control of the humidity in the air and thus that of the hydrogen carrying gas, as stated above.

As to claims 9 and 16, Katagiri et al.'s apparatuses as described above inherently have a method of operating (where claim 9 is the method of operating the apparatus of claim 1 and claim 13 is the method of operating the apparatus of claim 5). With respect to claim 9, humidifier [6] humidifies air, and supercharger [17] driven by a motor controls the flow rate of oxygen to the system, where there is no humidifier in the anode side of the fuel cell (as applied to claim 9). With respect to claim 16, humidifier [6] humidifies air, gas bypass passage [21] allows for bypassing the humidifier, valve [22] is controlled via controller [23], which is connected to dewpoint measuring device

Art Unit: 1745

[19] and thus inherently maintains hydrogen gas humidity in a predetermined range less than 100% (as diffusion dictates). Again, this setup does not include a humidifier on the hydrogen gas side.

The teachings of Katagiri et al. have been discussed above and are herein incorporated.

As to claims 2, 6, 10, and 14, Katagiri et al. teaches dewpoint measuring device [19], which is connected to voltmeter [20] that displays the output via controller [23]. Dewpoint measuring device is connected to the voltage, which is a product of both anode and cathode reactant sides, and therefore indirectly measures the humidity of the hydrogen-containing gas as well. As previously stated, gas bypass passage [21] allows for air bypassing the humidifier, where valve [22] controls the flow of the air through the humidifier via controller [23], which is connected to dewpoint measuring device [19] and thus inherently maintains hydrogen gas humidity in a predetermined range less than 100% (as diffusion dictates) (as applied to claims 6 and 14).

### ***Response to Arguments***

8. Applicant's arguments filed March 13, 2007 have been fully considered but they are not persuasive.

Applicant argues that Katagiri et al. does not disclose that the fuel cell system does not have a humidifier on the anode side. Furthermore, Applicant makes the specific point that the humidifier can be separately to the hydrogen side.

Examiner's rejection is applied to the embodiment that states the humidifier [6] is applied to the air side (and *not* one that has a humidity applied to the hydrogen side).

The humidity is imparted from the cathode side to the anode side through the water permeation through the separator membrane. Therefore, the hydrogen-containing gas is humidified absent a humidifier on the anode side.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).



9. Claims 4, 8, 12, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katagiri et al., as applied to claims 1, 5, 9, and 13.

As to claims 4, 8, 12, and 16, Katagiri et al.'s fuel cell system inherently has a method to circulate hydrogen-containing gas to the anode, since it is a reactant gas necessary for all fuel cells to work. Furthermore, it has been previously established that air flow is controlled by both motor [16] and bypass valve [22], the latter of which is controlled by controller [23] that uses information obtained by dewpoint controller [19] (which has been mentioned to inherently maintain the hydrogen-containing gas within a range of 100%).

However, Katagiri et al.'s invention does not specifically teach that there is a hydrogen-containing gas flow controller in the circulation passage. But, since there is a flow controller for the oxygen-containing gas, there is motivation for providing a flow controller for the hydrogen-containing gas. The motivation for putting a controller on the hydrogen-containing gas is to control the hydrogen flow so that the amount needed to react with the oxygen is provided, so that neither unreacted oxygen nor hydrogen is lost in the exhaust. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to include a flow controller in Katagiri et al.'s invention on the hydrogen-containing gas stream in order to ensure efficient use of the reactant gases. (Again, the obviated apparatus inherently includes the method of operating, as applied to claims 12 and 16.)

Claims 4, 8, 12, and 16 are alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Katagiri et al. in view of US 2004/0164509 (Kobayashi et al.).

The teachings of claims 1, 5, 9, and 13 have been discussed above and are incorporated herein.

Alternatively, the circulation passage as mentioned in claims 4, 8, 12 and 16 can be interpreted as a re-circulation passage as can be seen in figure 1 of the application (the passage from 30 to 38, across 24, and through 42).

In this case, the differences between Katagiri et al. and the claims are that Katagiri et al. teach neither (a) a circulation passage that re-circulates the exhaust from the hydrogen-containing gas nor (b) a hydrogen-containing gas flow rate controller in the (re-)circulation passage.

With respect to (a) Kobayashi et al. teaches a gas supplying apparatus to a fuel cell. In figure 1, it is seen that hydrogen is re-circulated by a path that starts with supply [31], passing to the fuel cell [1], and circulating around as controlled by valve [34].

The motivation for providing a re-circulation passage is to recycle the exhaust from the anode, thus ensuring that some of the unreacted hydrogen present in the exhaust is returned to the fuel cell to be reacted for provide electricity. It is important to note that the recycle system should be set up such that the humidity sensor is disposed within the re-circulation passage in order to provide accurate control of the humidity, as taught by Wheat et al., with the added re-circulation stream. The motivation for putting a controller on the hydrogen-containing gas is to control the hydrogen flow so that the amount needed to react with the oxygen is provides, so that neither unreacted oxygen nor hydrogen is lost in the exhaust.

Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Wheat et al. with the recycle system and hydrogen flow controller taught by Kobayashi et al. in order to provide improved usage of hydrogen fuel gas by the humidity control system and to ensure efficient use of the reactant gases.

With respect to (b) Katagiri et al. provides a flow controller for the oxygen-containing gas, which gives motivation for providing a flow controller for the hydrogen-containing gas. The motivation for putting a controller on the hydrogen-containing gas is to control the hydrogen flow so that the amount needed to react with the oxygen is provided, so that neither unreacted oxygen nor hydrogen is lost in the exhaust. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to include a flow controller in Katagiri et al.'s invention on the hydrogen-containing gas stream in order to ensure efficient use of the reactant gases.

Again, the obviated apparatus inherently includes the method of operating, as applied to claims 12 and 16.

***Allowable Subject Matter***

10. Claims 3, 7, 11, and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 3, 7, 11, and 15 teach a fuel cell system (claims 3 and 7) or operating a fuel cell system (claims 11 and 15), where the humidity sensor (and the use of the

humidity sensor) is placed in the circulation passage of the hydrogen-containing gas supply (while the humidifier is provided on the cathode side).

Neither Katagiri et al. or Kobayashi et al. alone or combined teach, suggest, or render obvious the use of a humidity sensor on the hydrogen-containing gas side, where the humidifier is provided on the cathode side. Katagiri et al.'s humidity sensor is on the same side of the humidifier (cathode). Furthermore, Katagiri et al. does not mention anything cross-sensing humidity from the anode side. Therefore the invention of claims 3, 7, 11, and 15 are considered patentable over the prior art of record.

### ***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugenia Wang whose telephone number is 571-272-4942. The examiner can normally be reached on 8 - 4:30 Mon. - Fri., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EW



**GREGG CANTELMO**  
**PRIMARY EXAMINER**

4/26/07